POPCORN

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POPCORN HYBRIDS have largely replaced open-pollinated varieties in commercial production. The better hybrids consistently yield more and make better products than varieties displaced.

Much of the crop is grown under contract for large processors and distributors. Commercial production, however, is a specialized job and requires experience both in growing and in marketing.

Some growers have been successful in selling their popcorn to customers who buy it year after year because of its quality and uniformity. Home gardeners still grow the crop for local consumption, but novices should have an assured outlet before planting any considerable acreage.

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POPCORN

By ARTHUR M. BRUNSON, *senior agronomist*, and GLENN M. SMITH, *agronomist Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration* [1]

Contents

POPCORN was evidently grown by the Indians of both North America and South America before the coming of the white man. The crop has been important commercially, however, only since about 1890, and its popularity has expanded greatly since 1940.

The use of popcorn confections, the rapid increase in popcorn concessions at amusement parks and motion-picture theaters, and the development of the small electric popper for use in the home have greatly increased the demand for popcorn and have made a profitable outlet for those who wish to grow the crop on a commercial scale. Although popcorn is still grown in the family garden for home and local consumption, its greater use in cities probably will make commercial production increasingly important, particularly with the development of improved hybrids.

The commercial crop is produced mainly in 12 States—Iowa, Nebraska, Kansas, Illinois, Indiana, Missouri, Ohio, Texas, Kentucky, Michigan, California, and Oklahoma. Iowa has always been the leading State, with production concentrated in the western section. The relative importance of other States has changed from time to time.

WILL IT PAY TO GROW POPCORN?

The frequently asked question, "Will it pay to grow popcorn?" cannot be answered simply by "Yes" or "No." In areas of regular commercial production popcorn probably pays the successful grower about as well as field corn or a little better. Where popcorn is not produced regularly in commercial quantity, however, the difficulties of marketing advantageously reduce the chances of success.

Profit in growing popcorn on a small scale to meet a local demand will depend upon the grower's ability both as a merchant and as a producer. He must, of course, produce economically a crop of good

[1] In cooperation with the Purdue University Agricultural Experiment Station, La Fayette, Ind. The original (1931) edition of this bulletin was under the authorship of the senior author only.

quality. To develop direct sales in competition with others, however, he must first use care in storing the product and then so prepare it for market that it will retain its quality and be attractive.

POPPING QUALITY

All starchy corns fall into one of four classes—popcorn, flint corn, dent corn, or flour corn—on the basis of the distribution and content of hard and soft starch. The starchy portions of the kernels of the best strains of popcorn are horny or corneous throughout or contain only a small core of soft starch near the center (fig. 1). Flint corn consists of a small quantity of soft starch completely surrounded by corneous starch. Dent corn has more soft starch, and the horny starch is mainly at the sides of the kernels. Flour corn is practically all soft starch with only traces of the hard.

Popping is due to the sudden release of pressure produced by steam generated within the kernel. The source of this steam is the moisture contained in the kernel. The popping properties of the different kinds of corn follow rather closely the relative proportion of horny starch in each. Popcorn, with the most hard starch, is far better than the others in poppability. Flint corn may pop fairly well, depend-

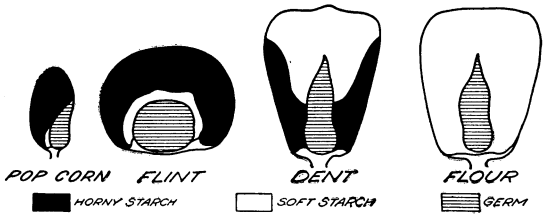

Figure 1.—**Location and relative proportions of horny and soft starch in the four main classes of starchy corn.**

ing on the strain; dent corn seldom, though occasionally a few kernels will pop feebly; and flour corn not at all. Just as popcorn pops better than flint corn, so popcorn having the least soft starch in the kernels pops best. This freedom from soft starch is probably the most important feature determining the popping expansion of different strains.

The quality of popcorn depends upon its flavor and tenderness. A large expansion during popping is closely associated with tenderness and is desirable also because it means a large volume of the finished product from a given quantity of the kernels. Popping expansion depends on three major conditions—the inherent structure of the kernels, their moisture content, and the proper application of heat.

HYBRIDS AND VARIETIES

During the past few years popcorn hybrids have become increasingly popular and seem likely to replace most of the acreage of open-pollinated varieties in the same way that dent corn hybrids replaced open-pollinated varieties in their field some 10 or 12 years earlier. Superiority of the hybrids is shown in the increase in yields, standing ability, and popping expansion, thus appealing to both the producer and the consumer.

Since 1940 several yellow popcorn hybrids have become available from the Kansas and Purdue (Indiana) Agricultural Experiment Stations. These hybrids were all single or three-way crosses involving Supergold and South American inbred lines, which had been developed at the Kansas Agricultural Experiment Station in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering. Their acceptance was so immediate that for 3 or 4 years seed stocks could not be multiplied rapidly enough to satisfy the demand. All

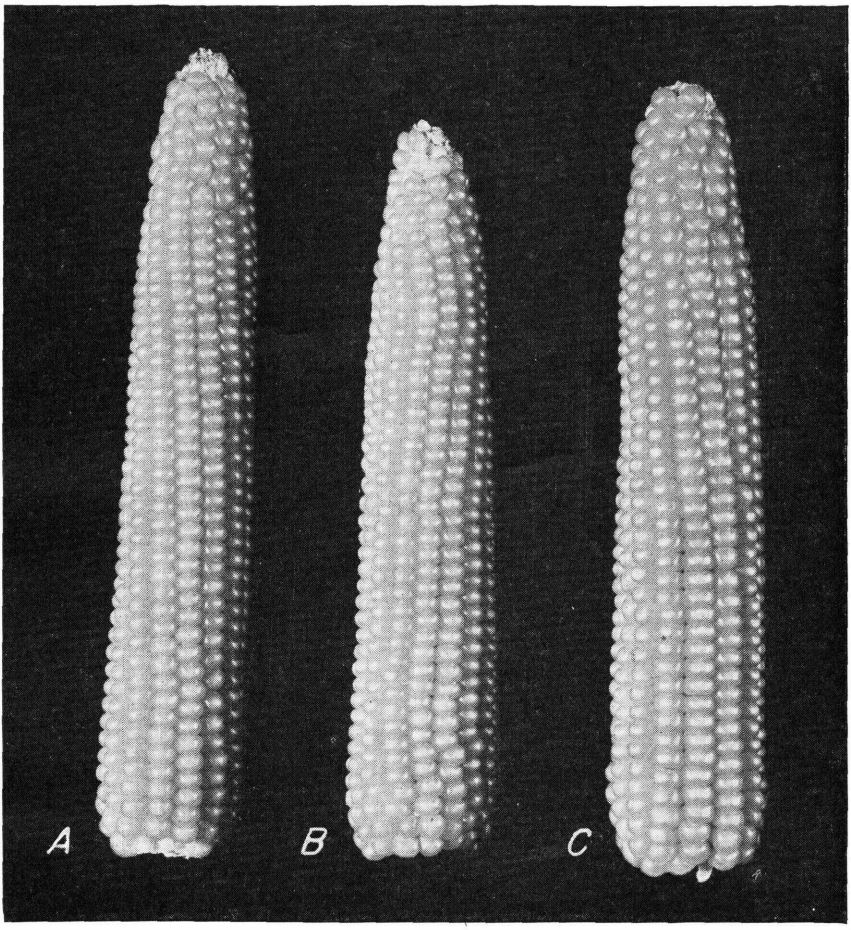

Figure 2.—Ears of three popcorn hybrids: *A*, Purdue 31; *B*, Purdue 32; *C*, Purdue 38.

these hybrids mature in about the same time as South American and seem to be widely adapted across the central and southern parts of the Corn Belt. The three most popular hybrids (figs. 2 and 3) are:

Purdue 31 (Sg16×Sg18) SA24).—This is slightly earlier than the other two. It combines high yield with good expansion and excellent quality and in some areas has become the most popular.

K4, or Purdue 32 ((Sg18×Sg30A) SA24).—This hybrid has the highest expansion and the best quality of the three. Kernels are rela-

tively small, and yields are not quite so high as for the other two hybrids. Although slightly later in silking than the other two, it matures and dries rapidly.

Purdue 38 ((Sg32×Sg16) SA24).—This is the highest yielding of the three. The large ears are ideally adapted to mechanical pickers but dry very slowly in fall. It is one of the largest kerneled hybrids, but popping expansion and quality are not the best.

The first popcorn hybrid available commercially was Minhybrid 250, distributed by the Minnesota Agricultural Experiment Station in 1935. It is of the Jap Hulless type and never gained widespread popularity, probably because it is adapted only to the northern edge of the Corn Belt.

Some of the other agricultural experiment stations have popcorn hybrids practically ready for commercial production, and several hybrids are being advertised by private companies. Hybrids of varying maturity and adapted to all sections of the popcorn-growing area should soon be available.

Similar in behavior to dent corn, the second generation of popcorn hybrids yields much less than the first. In fact, yield reductions are even more pronounced than in dent corn, because most popcorn hybrids

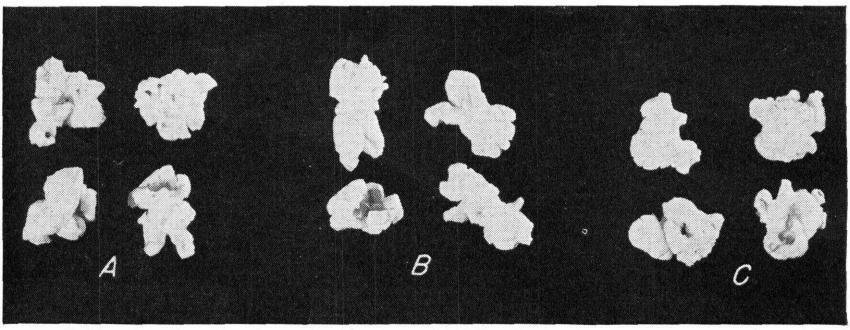

Figure 3.—**Popped kernels of three popcorn hybrids: A, Purdue 31; B, Purdue 32; C, Purdue 38.**

now available are single or three-way crosses, which suffer more serious declines in the second generation than the double crosses commonly used in dent corn. Comparisons of first- and second-generation seed of a number of popcorn hybrids in two different years at the Purdue Agricultural Experiment Station showed reduced yields of 20 to 50 percent from use of second-generation seed. The Federal Seed Act and the seed laws of several States make it unlawful to label second-generation seed as hybrid seed.

For the past 20 years South American has been the most widely grown open-pollinated variety. It developed from a somewhat obscure origin in the Kansas City territory about 1920 and gained popularity rapidly. It is a large-kerneled yellow pearl-type corn and is adapted to all but the northern part of the Corn Belt. Popping expansion is good, and popped kernels have a characteristic yellow mottled appearance with a varying proportion that "mushroom" to globular shape when popped.

Jap Hulless is the oldest open-pollinated variety still important in commercial production. It is considerably earlier than South Amer-

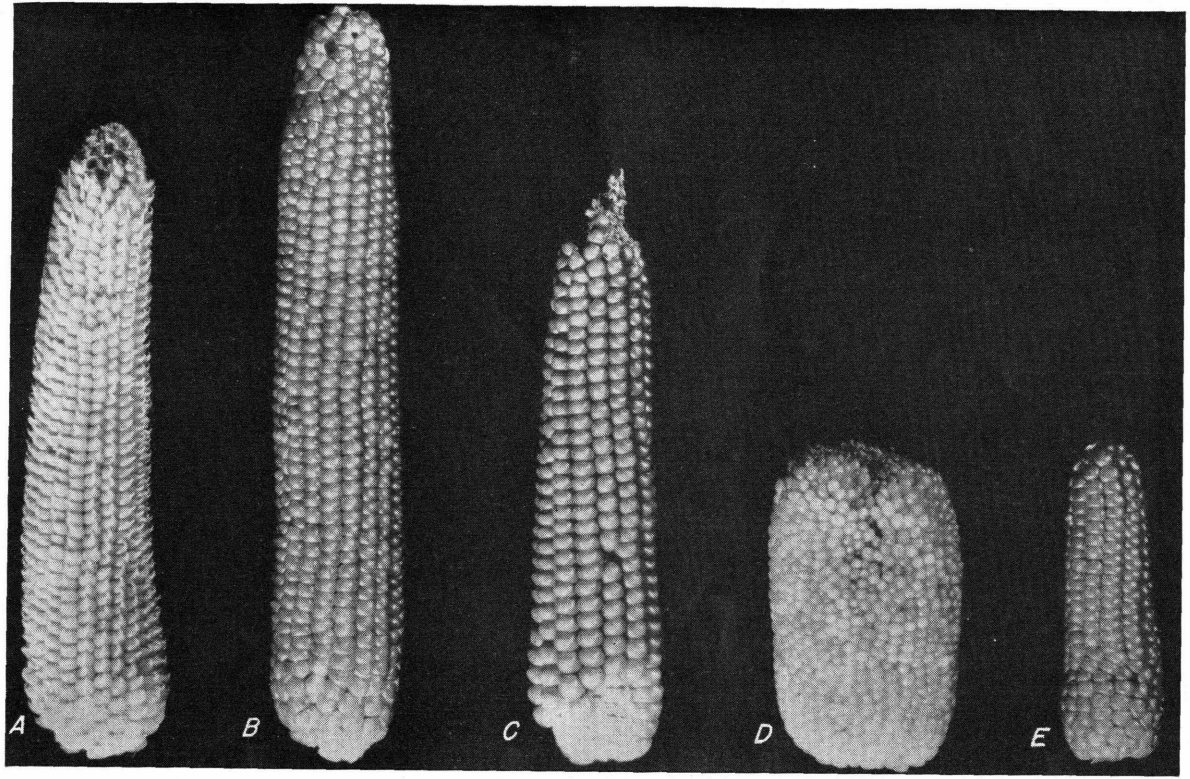

Figure 4.—Ears of five varieties of popcorn: *A*, White Rice; *B*, Queen Golden; C, South American; *D*, Jap Hulless; *E*, Tom Thumb.

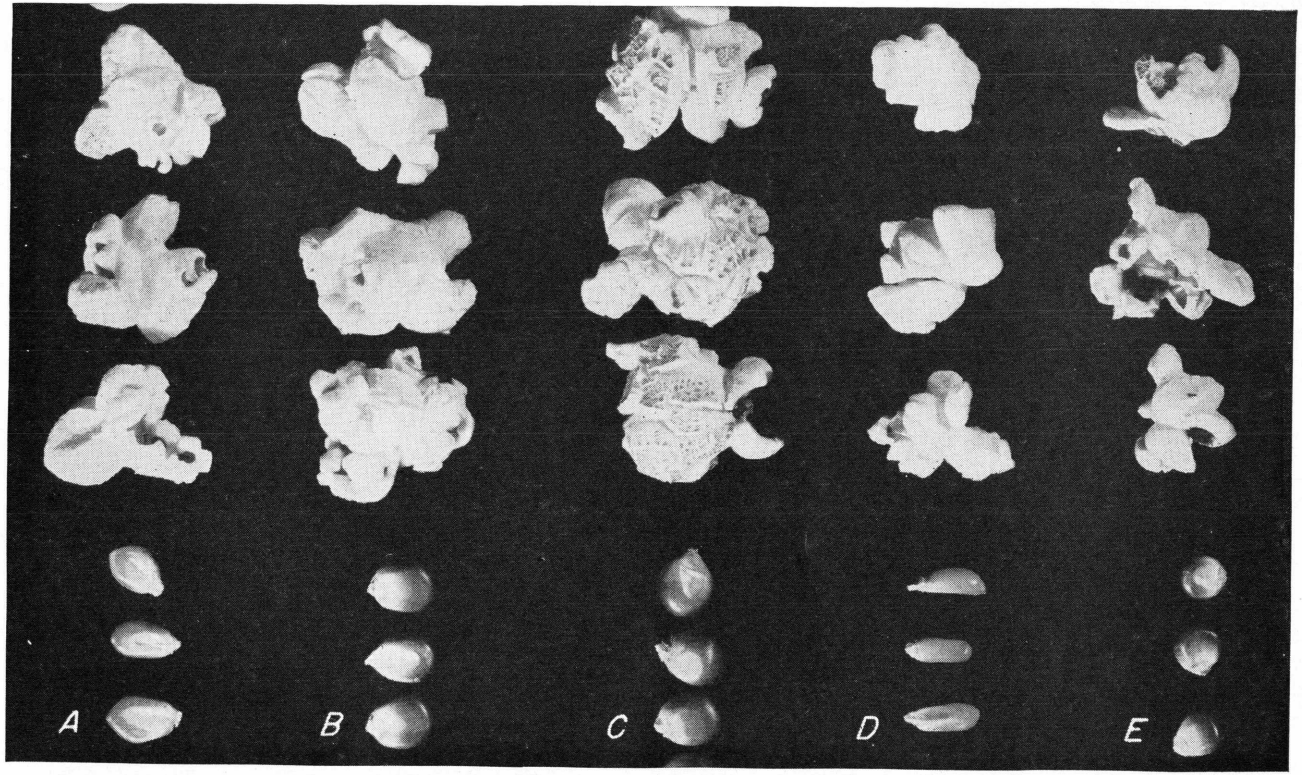

Figure 5.—Popped and unpopped kernels of five varieties of popcorn: *A*, White Rice; *B*, Queen Golden; *C*, South American; *D*, Jap Hulless; *E*, Tom Thumb.

ican and is adapted to the northern part of the Corn Belt. The ears are short and thick, with 30 to 40 rows of long slender kernels. Popping expansion and quality are both excellent.

Supergold and Yellow Pearl are very similar and are slightly earlier than South American. They are of the yellow pearl type, with tapering ears and fairly small kernels. Popping expansion and quality are very good to excellent.

White Rice and Queen Golden were leading varieties during the first two decades of this century but have now nearly disappeared from commercial production. In addition to those mentioned, a number of small-eared high-quality varieties and horticultural novelties are grown locally in home gardens. Some of the variations found in ears and kernels of different varieties are illustrated in figures 4 and 5.

SOILS, ROTATIONS, AND FERTILIZERS

Popcorn may be grown on any soil that will grow good field corn. Production should be restricted in general, however, to the more fertile soils that are not too light and sandy. There the crop will have opportunity to mature fully and to produce a high-grade product.

Crop rotation is even more important for popcorn grown regularly than for field corn. The smaller popcorn plants do not shade out the late weeds, so that popcorn land soon becomes foul unless crops are rotated.

In most parts of the Corn Belt, especially in the eastern sections, mineral fertilizers can be used to advantage for a corn crop. The three principal methods of utilizing commercial fertilizer are: (1) Row or hill application at time of planting; (2) plow-sole fertilization; and (3) fertilizing the preceding leguminous green-manure crop. Fertilizers high in phosphorus are particularly valuable in hastening popcorn development and making complete maturity more certain. The best rotation and fertilizer treatments for popcorn depend too largely on local conditions for discussion here. Recommendations by the State agricultural experiment stations for field-corn production in any given area are applicable also to popcorn.

PLANTING AND CULTIVATING

The usual methods of successful field-corn culture apply also to popcorn, with slight modifications. In the western part of the Corn Belt, particularly in Nebraska and Kansas, where listing is commonly used for field corn, popcorn also is usually listed. A practice growing in favor in this section is to blank-list in fall, throw in the ridges about 2 weeks before planting, and at planting time nose out the old furrows with a loose-ground lister or with a furrow-opener attachment on the corn planter (fig. 6). This method has two advantages—it kills two crops of early weeds cheaply and provides a warmer and mellower seedbed than ground freshly listed.

On plowed land, popcorn is usually checkrowed (fig. 7) to permit better cultivation. The rows, especially for the smaller varieties, should be somewhat closer together than for field corn. The rate of planting depends on variety, character of soil, normal rainfall, and other conditions. In general, the optimum rate will provide for 1¼ to 1¾ times as many plants per acre as field corn should have in the

Figure 6.—Unplowed field planted with a lister. Unless the ridges are first thrown in and then nosed out, the seedbed frequently will be cold and cloddy.

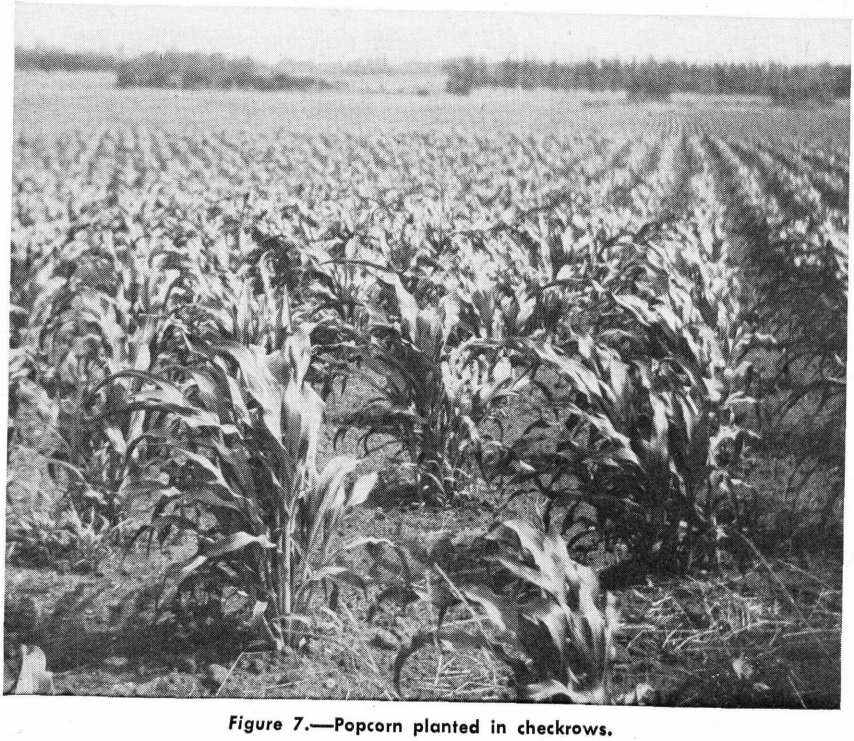

Figure 7.—Popcorn planted in checkrows.

same locality. From 3 to 6 pounds of seed is required to plant an acre, varying with size of seed and rate of planting.

Corn planters fitted with disk furrow openers are excellent for planting popcorn on plowed ground (fig. 8). The popcorn seedlings are small and grow slowly to a size suitable for cultivation. Planting with furrow openers allows early weeds to be killed cheaply with a harrow and without injury to the small corn plants.

Popcorn can be planted somewhat earlier than field corn, as the hard, corneous seed is not so easily damaged if the weather turns cold and wet. Early planting is recommended in most localities to give the crop ample time to mature normally and thoroughly.

Figure 8.—**Plowed field planted with a furrow-opener attachment on the planter.**

The primary purpose of cultivating corn is to control weeds. Both the yield and the quality of popcorn are injuriously affected by weed growth. The smaller stalks of popcorn cannot compete so well with weeds as field corn. The three principal practices that help to control weeds are (1) suitable rotations, (2) early and careful preparation of the ground, and (3) thorough cultivation.

HARVESTING

Harvesting is one of the most tedious tasks in popcorn production if hand labor is used. Practically all commercial acreage is now husked with mechanical pickers (fig. 9). Special popcorn rollers that greatly facilitate the operation of machines are available for most makes of pickers.

Popcorn should not be harvested until the moisture is down at least to 20 percent and preferably not until it is 15 to 17 percent. Complete normal maturity of the crop before the first killing frost is essential for

best quality and allows the grain to dry on the stalk to satisfactory cribbing condition.

DRYING

In the southern Great Plains and frequently in the southern edge of the Corn Belt, popcorn will dry in the field to approximately the correct moisture content for best popping. In the central and northern sections of the Corn Belt, however, there are relatively few years when it reaches this condition at husking time. The growing interest in artificial drying is enabling farmers to move the corn at once into market channels and to avoid the expense of keeping the large inventories an unnecessarily long time.

Many farmers have had unfortunate experiences with artificial drying, ranging from slight deterioration to total loss of popping ability.

Figure 9.—Most popcorn is now harvested with mechanical pickers.

Probably most of these disappointments have been due to too rapid drying. It is generally recognized that rapid loss of moisture reduces popping expansion. For producing the highest quality product many popcorn growers believe there is no substitute for slow natural curing on the stalk or in the crib. Experimental work under controlled conditions is needed to give information on which satisfactory drying methods can be based. In the absence of such information, it is probably safe to operate driers so that ear corn will not lose more than 1 percent moisture per day; or, if artificial heat is used, to limit temperatures to not more than 90° F. When drying bins through which heated air has been circulated are emptied, moisture will usually be found to be unevenly distributed, with the corn in the bottom appreciably drier than that at the top. Corn that has been heated in drying will continue to dry until the bin has entirely cooled down.

STORING

Popcorn should be stored on the ear at least until it is in good popping condition, preferably until shortly before using. Since popcorn is used as human food, special precautions must be taken to prevent damage by rats and mice while it is in storage. Officials of the Food and Drug Administration may condemn as unfit for popping any lot of corn fouled by rodents.

Storage facilities necessary in any locality depend on the normal moisture content of the corn at harvest and on the weather that usually follows. Where considerable drying in the crib is necessary, cribs 4 feet wide are advisable (fig. 10). If cribs are wider, temporary partitions or air tunnels, as shown in figure 11, are frequently used to provide the ventilation needed for proper curing. Directions for the

Figure 10.—**Mechanical elevators are widely used in cribbing popcorn. It should be stored in narrow cribs to facilitate drying.**

construction of various types of corn-crib ventilators are given in Farmers' Bulletin 1976, Handling and Storing Soft Corn on the Farm. Directions for the construction of rodentproof cribs may be obtained from most State agricultural experiment stations. The storage cribs of some of the large popcorn companies in centers of commercial production are models of satisfactory design and sound construction.

When ear corn is stored, it should be reasonably free from husks, silks, and shelled grain, particularly if the moisture content tends to be high. All diseased, immature, and off-type ears should be culled as the corn goes into the crib. If protected from rodents and not infested with storage insects, well-matured ear corn may be stored in a good crib 3 or 4 years without apparent loss in popping quality.

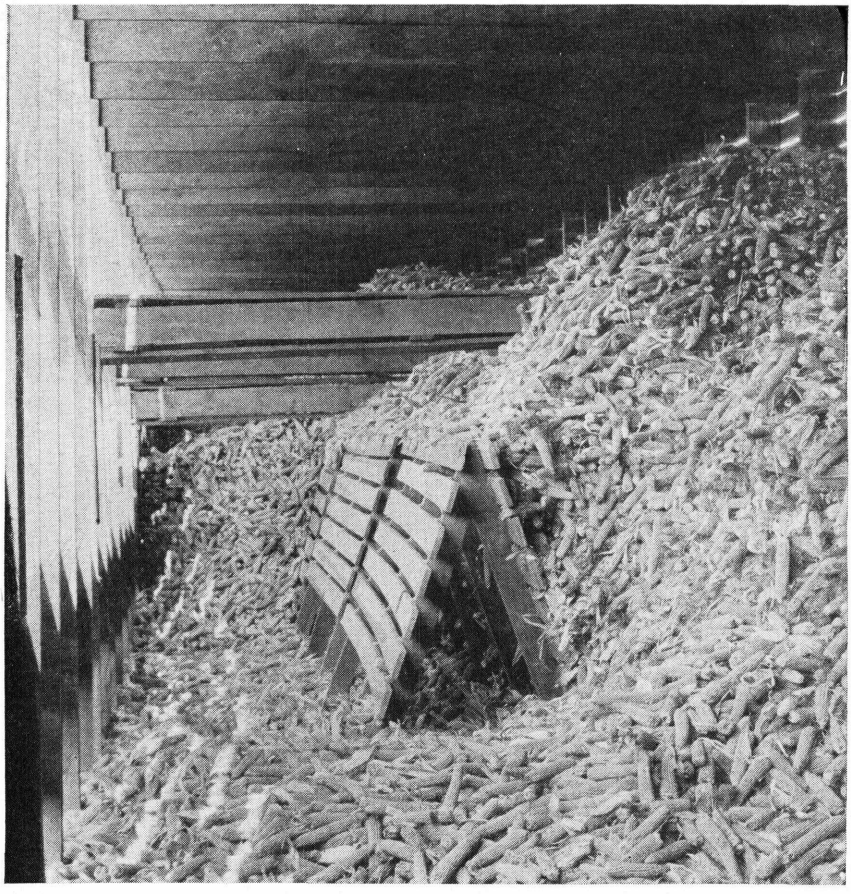

Figure 11.—**Movable A-shaped ventilators in a popcorn crib, foreground sections removed to show construction. These ventilators should extend the entire length of the crib to provide a free circulation of air.**

MOISTURE DETERMINATION

The official standards for corn specify that the percentage of moisture shall be that ascertained by the use of the water-oven method, or by any others that give equivalent results. The official standards for the small grains, on the other hand, specify that the percentage of moisture shall be that ascertained by the use of the air-oven method. These two methods yield appreciably different results on corn and thus cannot be used interchangeably. The moisture content of corn as determined by the air-oven method is usually about 1.5 percent higher than that determined by the water-oven method.

Both popping volume and keeping quality of popcorn depend on its moisture content. Growers, therefore, should have access to a satisfactory means of moisture determination. The Brown-Duval method is not satisfactory for popcorn. If the corn is heated rapidly it pops in the oil and fills the flask and if it is heated slowly to avoid popping, the determinations of moisture percentage may be too low. Since

the advent of the electric moisture meters such as the Tag-Heppenstall and Steinlite these machines are used almost universally for ascertaining the moisture content of popcorn. The conversion tables for corn and popcorn supplied with these machines are arranged to give moisture percentages equivalent to those determined by the official water-oven method. The directions given with these machines must be followed carefully and the proper conversion tables must be used to obtain accurate results. It is a good plan to have the moisture determinations on occasional samples checked by official tests at a State or Federal grain grading laboratory.

POPPING EXPANSION

Popping expansion is the ratio of the volume of corn after popping to that before popping. Thus, if a pint of unpopped corn increases in volume to 26 pints after popping, the corn is said to have a popping expansion of 26. This is probably the most valuable measure of quality used by the trade. Some of the more important factors influencing popping expansion and its measurement are moisture, temperature and kind of popper, and size and shape of containers.

MOISTURE

Moisture contents all the way from 11 to 15 percent have been recommended for giving the highest popping volume. The disagreement in recommendations may be due in part to difficulties of the various workers in determining moisture content accurately, and in part to differences in the kind and temperature of the popper used, the quantity of seasoning, and other factors. Experience indicates that popcorn pops at its best when a standard electric popper, a moderate quantity of seasoning, and popcorn with approximately 13½-percent moisture, as determined by the Tag-Heppenstall moisture meter, are used. A slightly higher moisture content is suitable when a wire popper is used. Drier samples should probably have higher popping temperatures than the more moist, although here again further information obtained under carefully controlled conditions is needed. Popcorn that is too dry pops with a smooth fracture, as contrasted with a slightly roughened surface at the correct moisture content and a rough surface when too moist.

KIND OF POPPER

Popcorn may be popped dry in a wire popper or with an oil seasoning in a tight-bottomed container. Most commercial seasonings have a coconut-oil base and contain artificial coloring. Any good shortening or vegetable oil may be used in the home. The usual proportion is 10 to 20 percent as much seasoning as unpopped corn, depending on personal preferences and the availability of fats.

TEMPERATURE OF POPPER

Thermostatically controlled electric poppers are adjusted at the factory to maintain a constant temperature while in operation. The temperature of those without thermostats can be regulated somewhat by varying the size of the charge. Gas-heated poppers are controlled

by varying the size of the flame. When an unshielded gas flame is used, slight drafts or air currents may make a considerable difference in the temperature of the popper and consequently may give variations in successive poppings of samples from the same lot of corn. Regulation of heat is largely a matter of experience, but under most conditions temperatures that will start the popping in 60 to 90 seconds give the best results.

SIZE AND SHAPE OF CONTAINERS

Any determination of popping expansion requires that the volume of the corn be measured before and after popping. The size and shape of the containers and the method of filling them may affect the results considerably. Measures with square corners and those unusually tall and narrow may have considerable waste space when apparently full.

In 1946 the National Association of Popcorn Manufacturers and the Popcorn Processors Association collaborated on the development of a standard machine and method for the determination of popping expansion. The equipment consists of measures for unpopped corn and seasoning, a graduated tube for direct reading of expansion, and a thermostatically controlled electric popper mounted on a frame. The general use of this expansion tester has done much to standardize popping determinations throughout the country.

MARKETING

As with most specialized crops, marketing is an important factor in determining whether popcorn is to return a profit. Three main outlets are open—local sale, contracted acreage, and selling on the open market.

Local or specialized sale is possible for growers who live near cities and where little popcorn is raised. With a little judicious advertising, a product of high and uniform quality will frequently find a ready market in a nearby city. It may even stimulate consumption and so develop a greater demand. One grower in Oregon, who has built up a reputation for quality, retails his entire crop each year to customers who call for it at the farm. The essentials for success in making local sales include (1) growing a high-quality variety, (2) getting proper moisture content, (3) sorting out diseased and moldy ears before shelling, (4) carefully shelling and cleaning, and (5) using clean, attractive sacks or packages. Growers who are careless about one or more of these points do not fully satisfy direct sales retail customers.

Much of the commercial popcorn acreage is always contracted for in advance by large popcorn companies and seed houses. This tends to stabilize the market and to guarantee a reasonable profit to both grower and jobber. The contract usually calls for delivering the entire crop in the ear to some designated shipping point or elevator (fig. 12) at a fixed price per pound. As part of its contract the company frequently furnishes the seed from which the crop is to be grown.

The grower who does not contract his crop in advance assumes the risk of fluctuation in price. When the crop happens to be short or the demand increases, bringing higher prices, he may make a sub-

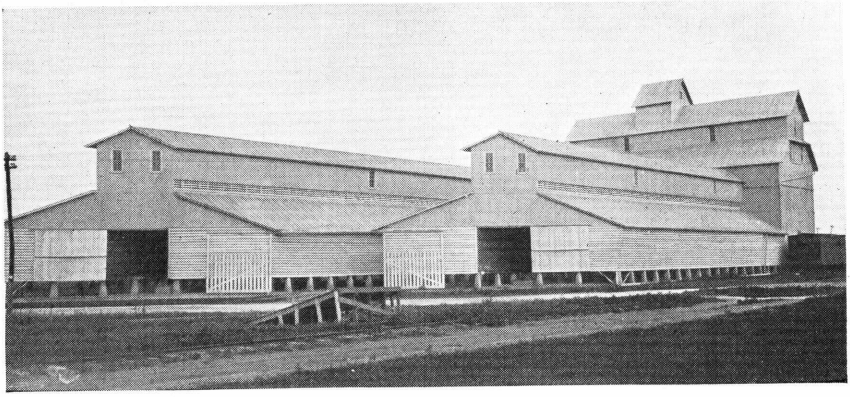

Figure 12.—Popcorn elevator and storage cribs.

stantial profit. On the other hand, if a considerable surplus is in sight at harvesttime, the free-lance grower will find buyers indifferent about taking noncontracted corn and be forced to sell at distress prices.

The popcorn acreage could easily be expanded to a point where production would become unprofitable. Only a year or two of relatively high popcorn prices or of relatively low field corn prices, or both, will tempt the regular growers of popcorn to increase their acreage. In addition, they have to compete with a host of new growers, attracted by stories of large profits of friends and neighbors. The results are overproduction, low prices, and losses.

The large popcorn companies keep in close touch with the current acreage and crop conditions as well as with the probable market demand and carry-over. They then regulate the prices for cash corn and their bids for contracted acreage accordingly. The small grower, by keeping informed on fluctuations in current cash prices, and particularly on the prices for the product of acreages contracted for the coming season, will know about market conditions and can make his plans accordingly. It is usually unwise, especially for the amateur popcorn grower, to plant a large acreage immediately following a year of high prices. The chances are that many others will do the same thing, with the result that the market will be flooded and prices will drop disastrously.

There are no standard grades for popcorn, but in general, for bulk retail samples, popping expansions under 20 volumes may be considered poor, those of 20 to 25 fair, those of 25 to 30 good, and those of 30 or more volumes excellent. Although expansion is usually considered in marketing popcorn, it should be given even more weight in determining the price. Some system of premiums for high-popping samples similar to the premiums paid for high-protein wheat could easily be worked out. The bulk of the popped corn, the end product, varies with popping expansion. Even more important, the tenderness and quality of the best popping corns are usually superior—a double advantage for the samples with high expansion.

Only 12 States are listed as important in producing the commercial popcorn crop, by the Crop Reporting Board, Bureau of Agricultural Economics, United States Department of Agriculture. Estimates of

TABLE 1.—*Acres of popcorn harvested by years in 12 States, 1925–47, as reported by the Crop Reporting Board, Bureau of Agricultural Economics, U. S. Department of Agriculture*

Year	Iowa	Nebraska	Kansas	Illinois	Indiana	Missouri	Ohio	Texas	Kentucky	Michigan	California	Oklahoma
1925	54, 100	12, 000										
1926	29, 400	13, 000										
1927	17, 500	8, 000										
1928	20, 700	11, 000										
1929	26, 300	11, 000	3, 500									
1929 [1]	*16, 678*	*8, 549*	*3, 473*	*1, 200*	*428*	*436*	*1, 003*	*116*	*73*	*1, 752*	*39*	*443*
1930	41, 200	11, 000	4, 000									
1931	19, 400	5, 800	9, 200									
1932	15, 000	5, 200	14, 400									
1933	6, 700	3, 000	3, 400									
1934	12, 400	(2)	1, 000									
1935	35, 000	17, 000	14, 000	6, 300	3, 500		4, 000	700	400	2, 700		
1936	13, 400	2, 000	440	10, 000	8, 200		9, 000	9, 100	1, 000	3, 500	1, 250	
1937	21, 200	3, 000	2, 800	12, 500	9, 000	1, 000	10, 000	18, 900	1, 200	4, 000	2, 500	
1938	20, 200	2, 500	2, 400	8, 000	7, 400	2, 000	9, 400	3, 350	900	3, 400	2, 300	
1939	20, 900	1, 600	3, 100	8, 200	8, 900	3, 900	9, 100	2, 400	900	3, 200	2, 300	
1939 [1]	*19, 870*	*1, 564*	*2, 991*	*8, 176*	*8, 810*	*3, 791*	*9, 090*	*2, 313*	*858*	*3, 167*	*2, 116*	*447*
1940	21, 000	1, 200	2, 000	7, 400	6, 200	4, 800	5, 500	3, 000	900	2, 350	2, 100	
1941	40, 200	2, 300	3, 000	9, 400	12, 000	8, 500	8, 300	4, 350	1, 500	2, 825	2, 100	2, 000
1942	41, 200	2, 900	3, 400	10, 600	8, 800	11, 500	9, 000	3, 000	3, 000	2, 550	2, 300	2, 000
1943	33, 300	4, 300	3, 900	9, 900	6, 300	7, 500	5, 800	3, 000	4, 000	1, 650	2, 000	8, 000
1944	50, 300	8, 700	5, 700	19, 500	17, 700	11, 500	13, 000	12, 500	13, 500	2, 400	2, 000	18, 000
1945	92, 000	33, 000	8, 400	24, 800	34, 800	15, 000	30, 000	16, 000	14, 400	3, 500	2, 000	38, 000
1946	41, 000	13, 000	5, 200	15, 800	18, 800	15, 000	14, 100	5, 000	10, 100	2, 000	1, 600	13, 000
1947 [3]	20, 000	4, 000	2, 800	12, 600	9, 400	10, 000	3, 900	4, 000	6, 500	500	2, 000	5, 000

[1] Data from U. S. Census.

[2] Total failure.

[3] Preliminary.

TABLE 2.—*Acreage, yield, production, and average price of the popcorn crop of the United States, 1912–47, as reported by the Crop Reporting Board, Bureau of Agricultural Economics, U. S. Department of Agriculture*

Year	Planted	Ear corn harvested			
		Area	Yield per acre	Production	Season average price [1]
	Acres	*Acres*	*Pounds*	*Pounds*	
1912		19, 300	2, 350	45, 355, 000	$4. 00
1913		21, 200	1, 838	38, 955, 000	3. 89
1914		14, 500	1, 822	26, 412, 000	3. 83
1915		8, 600	1, 250	10, 752, 000	3. 46
1916		18, 700	1, 997	37, 350, 000	4. 42
1917		23, 000	1, 397	32, 140, 000	4. 58
1918		36, 900	1, 254	46, 278, 000	5. 43
1919		42, 000	1, 820	76, 440, 000	5. 19
1920		22, 300	1, 633	36, 410, 000	4. 22
1921		10, 700	1, 729	18, 495, 000	3. 11
1922		14, 800	1, 550	22, 946, 000	2. 83
1923		24, 600	1, 799	44, 254, 000	2. 93
1924		30, 800	1, 205	37, 100, 000	2. 88
1925		66, 100	1, 589	105, 018, 000	2. 93
1926		42, 400	1, 265	53, 615, 000	2. 56
1927		25, 500	1, 651	42, 098, 000	2. 34
1928		31, 700	1, 334	42, 272, 000	2. 58
1929	41, 800	40, 800	1, 315	53, 633, 000	2. 74
1930	58, 500	56, 200	1, 189	66, 832, 000	2. 63
1931	35, 900	34, 400	1, 084	37, 292, 000	1. 94
1932	36, 200	34, 600	1, 234	42, 706, 000	1. 24
1933	13, 500	13, 100	1, 178	15, 435, 000	1. 19
1934	35, 600	13, 400	391	5, 246, 000	4. 98
1935	90, 800	83, 600	949	79, 312, 000	2. 29
1936	83, 550	57, 890	976	56, 508, 000	2. 76
1937	91, 700	86, 100	1, 205	103, 782, 000	1. 69
1938	63, 000	61, 850	1, 526	94, 370, 000	1. 58
1939	66, 200	64, 500	1, 555	100, 294, 000	1. 41
1940	58, 400	56, 450	1, 384	78, 133, 000	1. 57
1941	100, 000	96, 475	1, 299	125, 323, 000	2. 07
1942	105, 200	100, 250	1, 637	164, 101, 000	2. 92
1943	94, 700	89, 650	1, 410	126, 432, 000	4. 82
1944	182, 400	174, 800	1, 343	234, 747, 000	3. 77
1945	339, 500	311, 900	1, 372	427, 780, 000	3. 69
1946	167, 200	154, 600	1, 637	253, 092, 000	3. 51
1947 [2]		80, 700	1, 194	96, 395, 000	4. 72

[1] Received by farmers, per 100 pounds. [2] Preliminary.

the acreage harvested by years for these States, as far as available, are shown in table 1. An additional small commercial acreage is grown in a number of other States.

The acreage, yield, production, and average price of the popcorn of the entire country by years since 1912, as given by the Crop Reporting Board, are shown in table 2. Production has varied widely from year to year in response to fluctuations in both acreage and yield. By far the greatest increase in production in the history of the crop has occurred since 1940.

DISEASES AND INSECTS

The diseases and insects that injure field corn attack popcorn also. The more important diseases are smut; root, stalk, and ear rots; and leaf blight. Although ear rots are not particularly prevalent in popcorn, they are serious when they do occur, as they injure the quality of the product unless damaged ears are sorted out before shelling.

The more important insect pests attacking popcorn in the field are the European corn borer, the corn earworm, corn rootworms, chinch bugs, and cutworms. The same control measures used with dent corn are applicable also to popcorn.

Probably the most serious insect pests in popcorn in storage are the group that includes among others the Angoumois grain moth and the rice weevil.[2] They are worse in the South than in the North and in many Southern States may infest the crop before it is harvested. Except for local markets, growers in areas where insect damage is usual and severe cannot hope to compete with those in areas where it is negligible.

[2] See Farmers' Bulletin 1811 for directions on how to control grain storage insects.

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